

## PATENT ABSTRACTS OF JAPAN

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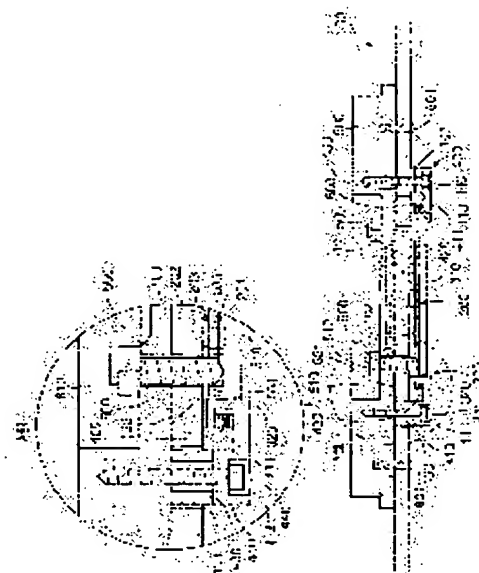
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## (54) PROBE CARD

## (57)Abstract:

PROBLEM TO BE SOLVED: To provide a probe card which prevents deformation of its components such as a contact unit, etc., and performs a test under an excellent conducting condition.

SOLUTION: The probe card is provided with a board body 100, the contact unit 300 which is fitted to the underside of the board body 100 and electrically connects a substance to be tested and connects the board body 100 as well, a supporting means 400 which supports the underside of the contactor unit 300 with an elastic force, and a parallelism adjusting screw 500 which touches the upside of the contactor unit 300 vertically and adjusts the parallelism of the contactor unit 300. Especially, the supporting means 400 has coil springs 420 arranged towards a vertical direction between a flange part 411 provided in an inside part of a supporting member 410 arranged below the board body 100, and a flange part 321 provided in the outside part of the contact unit 300.



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**CLAIMS**

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[Claim(s)]

[Claim 1]

In the probe card used for performing the electric trial of test objective-ed objects, such as a semiconductor device A substrate body and the contact unit which carries out electrical installation to a substrate body through INTAPOZA while being prepared in the one side of a substrate body and performing electric contact to a test objective-ed object, It has the support means which supports the one side of the contact unit with elastic force, and the parallelism adjustment device which adjusts the parallelism of the contact unit to the other side of the contact unit in contact with the direction of a vertical. Said support means is a probe card characterized by having composition with the coil spring which intervened towards the direction of a vertical between the supporter material arranged at the one side of a substrate body, and the flange prepared in the inside part of supporter material and the flange prepared at least in the lateral part of the contact unit.

[Claim 2]

The probe card characterized by arranging the 1st back up plate in contact with the body concerned in the other side of a substrate body in a probe card according to claim 1.

[Claim 3]

It is the probe card characterized by being attached in the 1st back up plate through the spacer inserted in punching to which supporter material was formed in the substrate body in the probe card according to claim 2.

[Claim 4]

The probe card characterized by preparing the heat-conduction sheet between a substrate body and the 1st back up plate in a probe card according to claim 2.

[Claim 5]

The probe card characterized by preparing the heat-conduction sheet respectively between a substrate body and the 1st back up plate between said spacer and 1st back up plate and between said spacers and said supporter material in a probe card according to claim 3.

[Claim 6]

In the probe card according to claim 2 to 5, the screw as said parallelism adjustment device is screwed on the 1st back up plate. While the point of the screw concerned is in contact with said contact unit through the hole formed in the substrate body The probe card characterized by being in contact with the part in which the 2nd back up plate which plugs up the hole formed on the plate concerned is attached in the 1st back up plate, the screw is screwed on the 2nd back up plate, and the point of the screw concerned is equivalent to the upper part location of the contact unit of a substrate body through said hole.

[Claim 7]

The probe card characterized by preparing the heat-conduction sheet between the 1st back up plate and the 2nd back up plate in a probe card according to claim 6.

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DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Field of the Invention]

This invention relates to the probe card for measuring the electrical characteristics of a semiconductor device etc.

[0002]

[Description of the Prior Art]

In recent years, about the wafer test by the probe card, measuring two or more chips to coincidence is made. As a conventional probe card, as shown in drawing 4, that by which the contact unit 300 which contains in a test objective-ed object slack semiconductor device contact which performs electric contact, and the substrate body 100 are formed into another object is well-known. If it is in such a probe card, the substrate body 100 and the contact unit 300 are electrically connected through INTAPOZA 200.

[0003]

Moreover, the flat spring 450 is being fixed to the lower part side of the substrate body 100 so that the free end may project in the direction of the inside, and the contact unit 300 is formed so that the parallelism adjustment device 500 for adjusting the parallelism of the contact unit 300 may contact a top face, while being supported by this flat spring 450 from a lower part side.

[0004]

the parallelism stretching screw 520 screwed on the back up plate 650 fixed above the substrate body 100 so that a point might project caudad through punching to which this parallelism adjustment device 500 was formed in the substrate body 100 — and By coming to consist of balls 530 prepared in the point (lower part) of the parallelism stretching screw 520 so that said contact unit 300 might be contacted, and making the amount of protrusions of the parallelism stretching screw 520 change, it is prepared so that the parallelism of the contact unit 300 may be adjusted.

[0005]

[Problem(s) to be Solved by the Invention]

However, if it is in the conventional probe card, when an adjustment stroke is applied to the parallelism stretching screw 520 too much at the time of parallelism adjustment, we are anxious about deformation and breakage of the contact unit 300. That is, the flat spring 450 which supports the contact unit 300 will have the large amount of pressure variation according to a stroke on that property, for this reason, too much force will act on the contact unit 300, and deformation and breakage of the contact unit 300 will occur according to this force. Such deformation and breakage of the contact unit 300 cause the height variation of contact, and it has the problem of bringing about defective continuity with a measuring object object. Similarly, above deformation and breakage of the contact unit 300 also have the problem of bringing about defective continuity with INTAPOZA 200.

[0006]

Furthermore, if it is in the conventional probe card, like illustration, an end side is fixed to the flat-spring holder 460 fixed under the substrate body 100, and the flat spring 450 is formed so

that free one end of the other end projected inside may support the contact unit 300. Moreover, the back up plate 640,650 is being fixed independently above the substrate body 100 in and abroad, respectively, and the outside back up plate 640 is allotted to the upper part location of said flat-spring holder 460, and the inside back up plate 650 is the inside [ back up plate / 640 / of this outside ], and is allotted to the upper part location of the free end of a flat spring 450. And said parallelism stretching screw 500 is screwed on the back up plate 650 of this inside. For this reason, to the flat-spring holder 460, the force of acting by the above-mentioned flat spring 450 will act as force by the side of a lower part, and will act as force by the side of the upper part to the inside back up plate 650. And since the outside back up plate 640 located above the flat-spring holder 460 as mentioned above and the back up plate 650 of the inside located above the free end of a flat spring are formed independently, the force by the flat spring 450 acts in the direction in which the upper part and a lower part change with locations, for this reason, according to the force of a flat spring 450, deformation of the substrate body 100 arises on the substrate body 100, and loam \*\*\*\*\* exists defective continuity with this electric deformation in it.

[0007]

Furthermore, in the trial of the basis under an elevated temperature, the temperature gradient of each configuration member is produced, the curvature of the whole substrate body occurs by the difference of the amount of strains of each configuration member based on this temperature gradient, and it also has loam \*\*\*\*\* for electric defective continuity by this curvature. In addition, the coefficient of thermal expansion of an ingredient is adjusted to a precision, and this problem cannot prevent curvature actually completely, although making it not generate curvature is also thought of using the ingredient which adjusted coefficient of thermal expansion corresponding to the temperature gradient of each part material.

[0008]

This invention is created under the above-mentioned background, deformation of configuration members, such as the contact unit, is prevented, and it aims at offering the probe card which a trial can perform also as that of good switch-on.

[0009]

[Means for Solving the Problem]

The probe card of this invention is a probe card used for performing the electric trial of test objective-ed objects, such as a semiconductor device. A substrate body, The contact unit which carries out electrical installation to a substrate body through INTAPOZA while being prepared in the one side of a substrate body and performing electric contact to a test objective-ed object, It has the support means which supports the one side of the contact unit with elastic force, and the parallelism adjustment device which adjusts the parallelism of the contact unit to the other side of the contact unit in contact with the direction of a vertical. Said support means has composition with the coil spring which intervened towards the direction of a vertical between the supporter material arranged at the one side of a substrate body, and the flange prepared in the inside part of supporter material and the flange prepared at least in the lateral part of the contact unit.

[0010]

Moreover, it is desirable to adopt the configuration which arranges the 1st back up plate in contact with the body concerned in the other side of a substrate body. In this case, it is much more desirable to adopt the configuration which attaches supporter material in the 1st back up plate through the spacer inserted in punching formed in the substrate body.

[0011]

Moreover, it is desirable to make it the configuration which prepared the heat-conduction sheet between a substrate body and the 1st back up plate. Similarly, it is good to prepare a heat-conduction sheet respectively between a spacer and the 1st back up plate and between a spacer and supporter material.

[0012]

Moreover, it is good to use a screw as a parallelism adjustment device. That is, it is good to screw the screw on the 1st back up plate, and to adopt the configuration in which the point

contacts said contact unit through the hole formed in the substrate body. In this case, the 2nd back up plate which plugs up the hole formed on the plate concerned is attached in the 1st back up plate, the screw is screwed on the 2nd back up plate, and it is desirable to adopt the configuration which contacts the part in which the point of this screw is equivalent to the upper part location of the contact unit of a substrate body through said hole.

[0013]

Furthermore, it is desirable to adopt the configuration in which the heat-conduction sheet was prepared between the 1st back up plate and the 2nd back up plate.

[0014]

[Embodiment of the Invention]

Hereafter, the gestalt of operation of the probe card concerning this invention is explained, referring to drawing 1 thru/or drawing 3. the probe card of drawing 1 concerning the gestalt of operation of the 1st of this invention is rough -- it is a sectional view a part. the probe card of drawing 2 concerning the gestalt of operation of the 2nd of this invention is rough -- it is a sectional view a part. the probe card of drawing 3 concerning the gestalt of operation of the 3rd of this invention is rough -- it is a sectional view a part.

[0015]

<The 1st operation gestalt>

The probe card concerning the gestalt of the 1st operation is what is used in performing the electric trial of test objective-ed objects, such as a semiconductor device. The substrate body 100, The contact unit 300 in which electrical installation is made by the substrate body 100 through INTAPOZA 200 while being prepared in the lower part side of the substrate body 100 and performing electric contact to a test objective-ed object, The support means 400 which supports the contact unit 300 with elastic force from a lower part side, It has the parallelism stretching screw 500 as a parallelism adjustment device which adjusts the parallelism of the contact unit 300 to the contact unit 300 in contact with the direction of a vertical from an upper part side, and the back up plate 600 (it is equivalent to the 1st back up plate) fixed above the substrate body 100 by contacting this.

[0016]

The circuit pattern etc. is formed in the front face, and the substrate body 100 has become connectable electrically with the circuit tester outside drawing. Measurement of the electrical characteristics of a test objective-ed object is performed by this circuit tester.

[0017]

The back up plate 600 is a substrate with which the circle-like hole 610 was formed in the center section of the top face, touches the substrate body 100 and is being fixed with the fixed screw 601. That in which the screw head section was prepared horizontally is used for the fixed screw 601 like NABENEJI. For this reason, the horizontal gap with the substrate body 100 and the back up plate 600 can be adjusted easily.

[0018]

A total of three parallelism stretching screws 500 are screwed on the height 603 which made disc-like [ which the hole 610 of the back up plate 600 has the level difference, among those is equivalent to a base ] at intervals of the pitch 120 degrees. The jam nut 510 for regulating rotation is screwed on the parallelism stretching screw 500, and it rotates carelessly.

[0019]

The parallelism stretching screw 500 is in contact with the contact unit 300 through the hole 102 where the point was formed in the substrate body 100. The point of the parallelism stretching screw 500 is formed in the shape of a curved surface, and, for this reason, makes a ball like before unnecessary.

[0020]

The contact unit 300 consists of a needle unit 310 by which two or more contact for contacting a test objective-ed object and connecting electrically was attached in the circular substrate, and a needle unit holder 320 which made the shape of a ring which supports the periphery section of the needle unit 310 from the lower part. The needle unit holder 320 is making cross-section inverse L-shaped, and at least the lateral part is the ring-like flange 321.

[0021]

INTAPOZA 200 is junction terminal block which connects electrically between the circuit pattern formed in the top face of the needle unit 310 of the contact unit 300, the circuit patterns formed in the inferior surface of tongue of the substrate body 100. The bottom probe 201 with which a tip contacts the circuit pattern by the side of the needle unit 310 etc., It has composition with the substrate 203 with which the pattern which each other end of the top probe 202 with which a tip contacts the circuit pattern by the side of the substrate body 100 etc., and the top and the bottom probes 201 and 202 is being fixed, and carries out electrical connection of between each probe was formed. The hole 204 for letting the parallelism stretching screw 500 pass is formed in the substrate 203.

[0022]

The support means 400 has composition with the coil spring 420 which intervened towards the direction of a vertical between the ring-like supporter material 410 which made the shape of a cross section of L characters arranged in the one side of the substrate body 100, and the contact unit 300 and the supporter material 410. The inside part of the supporter material 410 serves as the ring-like flange 411. That is, two or more mediation of the coil spring 420 is carried out between the flange 321 of the needle unit holder 320, and the flange 411 of the supporter material 410.

[0023]

Through the spacer 430 for height adjustment inserted in the punching 101 formed in the substrate body 100, the supporter material 410 uses the fixed screw 440 for the back up plate 600, and is attached in it. The hold crevice 413 in which the head of the fixed screw 440 is held is formed in the supporter material 410 so that the head of the fixed screw 440 may not project in a lower part side (test objective-ed object side).

[0024]

In addition, the field (inferior surface of tongue) where the needle unit holder 320 of the supporter material 410 and the contact unit 300 all counters a test objective-ed object is established as a 6.3 or less \*\*\*\* Ry or 6.3 or less Rz mirror plane. The radiant heat etc. was reflected according to this mirror plane, and it has controlled that supporter material 410 grade becomes an elevated temperature.

[0025]

Between a spacer 430 and the supporter material 410, the heat-conduction sheet intervenes between the back up plate 600 and a spacer 430 between the substrate body 100 and the back up plate 600. Thereby, the temperature gradient between each part material was lessened, and the curvature by the temperature gradient between each part material is controlled.

[0026]

In the probe card which consists of the above-mentioned configuration, since it is supported by the coil spring 420 to which the contact unit 300 intervened towards the direction of a vertical between the supporter material 410, as compared with what is supported by the conventional flat spring, the rate of change of the compressive force over the amount of strokes is small, and becomes good [ the linearity of the amount of strokes, and elastic force ]. For this reason, while being able to prevent exactly breakage and deformation of the needle unit holder 320, the parallelism of the contact unit 300 can also be adjusted easily.

[0027]

Moreover, since the supporter material 410 is attached in the back up plate 600 through the spacer 430, the elastic force of a coil spring 420 cannot act on the substrate body 100 directly, but can prevent deformation of the substrate body 100. And since the heat-conduction sheet intervenes between the substrate body 100 and the back-up-plate 600 grade, heat conduction between these each part becomes good, and the curvature by the temperature gradient between each part material can be prevented. These results, high location precision is realized between INTAPOZA 200 and the substrate body 100 between the contact unit 300 and INTAPOZA 200 between a test objective-ed object and the contact unit 300, and it becomes possible to perform measurement by good switch-on as a result.

[0028]

## &lt;The gestalt of the 2nd operation&gt;

Next, although the probe card concerning the gestalt of the 2nd operation is explained, about the thing concerning the gestalt of the 1st operation, and the thing which has same configuration and function, the detailed explanation is omitted using the same sign.

[0029]

In the probe card concerning the gestalt of the 2nd operation, differing from the gestalt of the 1st operation greatly is only the point that the supporter material 410 is attached in the back up plate 600 using the fixed screw 440, without using a spacer 430. Since the fixed screw 440 is inserted in the punching 103 formed in the substrate body 100, the elastic force of a coil spring 420 cannot act on the substrate body 100 directly, but deformation of the substrate body 100 can be prevented, and this point is the same as that of the case of the gestalt of the 1st operation.

[0030]

Moreover, between the substrate body 100 and the back up plate 600, since the heat-conduction sheet intervenes respectively between the substrate body 100 and the supporter material 410, the temperature gradient between each part material can be lessened like the case of the gestalt of the 1st operation. From this, the curvature by the temperature gradient between each part material can be prevented, and this point is the same as that of the case of the gestalt of the 1st operation.

[0031]

## &lt;The gestalt of the 3rd operation&gt;

Next, although probe card \*\*\*\*\* explanation is given, about the thing concerning the gestalt of the 3rd operation which has the 1st, and the same same configuration and function as the gestalt of the 2nd operation, the detailed explanation is omitted using the same sign.

[0032]

In the probe card concerning the gestalt of the 3rd operation, differing from the gestalt of the 1st operation greatly is only a point which the screw 620 is screwed on the back up plate 630 as if the back up plate 630 which plugs up a hole 610 is attached in the back up plate 600, and is in contact with the part in which the point of a screw 620 is equivalent to the upper part location of the contact unit 310 of the substrate body 100 through a hole 610. The jam nut 621 is screwed on the screw 620, and it rotates carelessly. The point of a screw 620 is formed in the shape of a curved surface. Moreover, the heat-conduction sheet intervenes also between the back up plate 620 and the back up plate 630.

[0033]

Since the elastic force of a coil spring 420 acts on the substrate body 100 through the contact unit 320 and INTAPOZA 200, it becomes the inclination for the central part of the substrate body 100 to curve upward, but since this part is suppressed with the screw 620, the deformation of the substrate body 100 also including the point that the heat-conduction sheet intervenes between the back up plate 620 and the back up plate 630 can be prevented exactly. Therefore, high location precision is realized between INTAPOZA 200 and the substrate body 100 between the contact unit 300 and INTAPOZA 200 between a test objective-ed object and the contact unit 300, and it becomes possible to perform measurement by good switch-on as a result.

[0034]

In addition, like the gestalt of the 1st operation, if it is in the gestalt of the 3rd operation, although the spacer 430 is intervened between the supporter material 410 and the back up plate 600, it is also possible to adopt the gestalt of the 2nd operation and the gestalt between which a spacer 430 is not made to be placed similarly.

[0035]

In addition, the probe card concerning this invention may use the thing of what kind of configuration, as long as it has the function to carry out electrical installation to a substrate body through INTAPOZA, while not being limited to the gestalt of the above-mentioned implementation, for example, performing electric contact to a test objective-ed object about the contact unit. This point is the same also about a parallelism adjustment device. Moreover, about a support means, as long as it has the function which supports the one side of the contact unit



with elastic force using the coil spring which intervened towards the direction of a vertical between the flange prepared in the inside part of supporter material, and the flange prepared at least in the lateral part of the contact unit, the thing of what kind of configuration may be used. Furthermore, you may make it adopt the configuration which omitted the back up plate.

[0036]

[Effect of the Invention]

As mentioned above, since it has composition supported by the coil spring to which the contact unit intervened towards the direction of a vertical between supporter material when based on the probe card concerning this invention, as compared with what is supported by the conventional flat spring, the rate of change of the compressive force over the amount of strokes becomes small, and the linearity of the amount of strokes and elastic force also becomes good. For this reason, while breakage and deformation of a needle unit holder can be prevented exactly, the parallelism of the contact unit can also be adjusted easily and it becomes possible to perform measurement by good switch-on as a result.

[0037]

When it considers as the configuration which arranges the 1st back up plate in contact with this in the other side of a substrate body, deformation of a substrate body can be prevented by the 1st back up plate. Furthermore, when it considers as the configuration which attaches supporter material in the 1st back up plate through the spacer inserted in punching formed in the substrate body, it becomes impossible for the elastic force of a coil spring to act on a substrate body directly, and it can prevent deformation of a substrate body exactly at this point. In connection with this, high location precision is realized between INTAPOZA and a substrate body between the contact unit and INTAPOZA between a test objective-ed object and the contact unit, and it becomes possible to perform measurement by good switch-on at this point.

[0038]

Since heat conduction between these each part becomes good when it is made the configuration which prepared the heat-conduction sheet between a substrate body and the 1st back up plate etc., the curvature by the temperature gradient between each part material can be prevented, and it becomes possible to perform measurement by good switch-on like the above at this point.

[0039]

The 2nd back up plate which plugs up the hole formed on the plate concerned is attached in the 1st back up plate. When it is made the configuration which contacts the part in which the screw is screwed on the 2nd back up plate, and the point of this screw is equivalent to the upper part location of the contact unit of a substrate body through said hole, Although it becomes the inclination for the central part of a substrate body to curve upward since the elastic force of a coil spring acts on a substrate body through the contact unit and INTAPOZA Since this part is suppressed with a screw, deformation of a substrate body can be prevented exactly and it becomes possible to perform measurement by good switch-on like the above at this point.

[Brief Description of the Drawings]

[Drawing 1] rough [ for explaining the gestalt of operation of the 1st of the probe card concerning this invention ] -- it is a sectional view a part.

[Drawing 2] the probe card concerning the gestalt of operation of the 2nd of this invention is rough -- it is a sectional view a part.

[Drawing 3] the probe card concerning the gestalt of operation of the 3rd of this invention is rough -- it is a sectional view a part.

[Drawing 4] It is the rough sectional view showing the conventional probe card.

[Description of Notations]

100 Substrate Body

101 Punching

103 Punching

200 INTAPOZA

300 Contact Unit

310 Needle Unit

320 Needle Unit Holder  
321 Flange  
400 Support Means  
410 Supporter Material  
411 Flange  
420 Elastic Member  
440 Fixed Means  
500 Parallelism Stretching Screw  
600 Back Up Plate (1st Back Up Plate)  
610 Screw  
630 Back Up Plate (2nd Back Up Plate)

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TECHNICAL FIELD

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[Field of the Invention]

This invention relates to the probe card for measuring the electrical characteristics of a semiconductor device etc.

[0002].

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PRIOR ART

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[Description of the Prior Art]

In recent years, about the wafer test by the probe card, measuring two or more chips to coincidence is made. As a conventional probe card, as shown in drawing 4 , that by which the contact unit 300 which contains in a test objective-ed object slack semiconductor device contact which performs electric contact, and the substrate body 100 are formed into another object is well-known. If it is in such a probe card, the substrate body 100 and the contact unit 300 are electrically connected through INTAPOZA 200.

[0003]

Moreover, the flat spring 450 is being fixed to the lower part side of the substrate body 100 so that the free end may project in the direction of the inside, and the contact unit 300 is formed so that the parallelism adjustment device 500 for adjusting the parallelism of the contact unit 300 may contact a top face, while being supported by this flat spring 450 from a lower part side.

[0004]

the parallelism stretching screw 520 screwed on the back up plate 650 fixed above the substrate body 100 so that a point might project caudad through punching to which this parallelism adjustment device 500 was formed in the substrate body 100 — and By coming to consist of balls 530 prepared in the point (lower part) of the parallelism stretching screw 520 so that said contact unit 300 might be contacted, and making the amount of protrusions of the parallelism stretching screw 520 change, it is prepared so that the parallelism of the contact unit 300 may be adjusted.

[0005]

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## EFFECT OF THE INVENTION

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### [Effect of the Invention]

As mentioned above, since it has composition supported by the coil spring to which the contact unit intervened towards the direction of a vertical between supporter material when based on the probe card concerning this invention, as compared with what is supported by the conventional flat spring, the rate of change of the compressive force over the amount of strokes becomes small, and the linearity of the amount of strokes and elastic force also becomes good. For this reason, while breakage and deformation of a needle unit holder can be prevented exactly, the parallelism of the contact unit can also be adjusted easily and it becomes possible to perform measurement by good switch-on as a result.

[0037]

When it considers as the configuration which arranges the 1st back up plate in contact with this in the other side of a substrate body, deformation of a substrate body can be prevented by the 1st back up plate. Furthermore, when it considers as the configuration which attaches supporter material in the 1st back up plate through the spacer inserted in punching formed in the substrate body, it becomes impossible for the elastic force of a coil spring to act on a substrate body directly, and it can prevent deformation of a substrate body exactly at this point. In connection with this, high location precision is realized between INTAPOZA and a substrate body between the contact unit and INTAPOZA between a test objective-ed object and the contact unit, and it becomes possible to perform measurement by good switch-on at this point.

[0038]

Since heat conduction between these each part becomes good when it is made the configuration which prepared the heat-conduction sheet between a substrate body and the 1st back up plate etc., the curvature by the temperature gradient between each part material can be prevented, and it becomes possible to perform measurement by good switch-on like the above at this point.

[0039]

The 2nd back up plate which plugs up the hole formed on the plate concerned is attached in the 1st back up plate. When it is made the configuration which contacts the part in which the screw is screwed on the 2nd back up plate, and the point of this screw is equivalent to the upper part location of the contact unit of a substrate body through said hole, Although it becomes the inclination for the central part of a substrate body to curve upward since the elastic force of a coil spring acts on a substrate body through the contact unit and INTAPOZA Since this part is suppressed with a screw, deformation of a substrate body can be prevented exactly and it becomes possible to perform measurement by good switch-on like the above at this point.

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TECHNICAL PROBLEM

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[Problem(s) to be Solved by the Invention]

However, if it is in the conventional probe card, when an adjustment stroke is applied to the parallelism stretching screw 520 too much at the time of parallelism adjustment, we are anxious about deformation and breakage of the contact unit 300. That is, the flat spring 450 which supports the contact unit 300 will have the large amount of pressure variation according to a stroke on that property, for this reason, too much force will act on the contact unit 300, and deformation and breakage of the contact unit 300 will occur according to this force. Such deformation and breakage of the contact unit 300 cause the height variation of contact, and it has the problem of bringing about defective continuity with a measuring object object. Similarly, above deformation and breakage of the contact unit 300 also have the problem of bringing about defective continuity with INTAPOZA 200.

[0006]

Furthermore, if it is in the conventional probe card, like illustration, an end side is fixed to the flat-spring holder 460 fixed under the substrate body 100, and the flat spring 450 is formed so that free one end of the other end projected inside may support the contact unit 300. Moreover, the back up plate 640,650 is being fixed independently above the substrate body 100 in and abroad, respectively, and the outside back up plate 640 is allotted to the upper part location of said flat-spring holder 460, and the inside back up plate 650 is the inside [ back up plate / 640 / of this outside ], and is allotted to the upper part location of the free end of a flat spring 450. And said parallelism stretching screw 500 is screwed on the back up plate 650 of this inside. For this reason, to the flat-spring holder 460, the force of acting by the above-mentioned flat spring 450 will act as force by the side of a lower part, and will act as force by the side of the upper part to the inside back up plate 650. And since the outside back up plate 640 located above the flat-spring holder 460 as mentioned above and the back up plate 650 of the inside located above the free end of a flat spring are formed independently, the force by the flat spring 450 acts in the direction in which the upper part and a lower part change with locations, for this reason, according to the force of a flat spring 450, deformation of the substrate body 100 arises on the substrate body 100, and loam \*\*\*\*\* exists defective continuity with this electric deformation in it.

[0007]

Furthermore, in the trial of the basis under an elevated temperature, the temperature gradient of each configuration member is produced, the curvature of the whole substrate body occurs by the difference of the amount of strains of each configuration member based on this temperature gradient, and it also has loam \*\*\*\*\* for electric defective continuity by this curvature. In addition, the coefficient of thermal expansion of an ingredient is adjusted to a precision, and this problem cannot prevent curvature actually completely, although making it not generate curvature is also thought of using the ingredient which adjusted coefficient of thermal expansion corresponding to the temperature gradient of each part material.

[0008]

This invention is created under the above-mentioned background, deformation of configuration members, such as the contact unit, is prevented, and it aims at offering the probe card which a

trial can perform also as that of good switch-on.  
[0009]

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[Translation done.]

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MEANS

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[Means for Solving the Problem]

The probe card of this invention is a probe card used for performing the electric trial of test objective-ed objects, such as a semiconductor device. A substrate body, The contact unit which carries out electrical installation to a substrate body through INTAPOZA while being prepared in the one side of a substrate body and performing electric contact to a test objective-ed object, It has the support means which supports the one side of the contact unit with elastic force, and the parallelism adjustment device which adjusts the parallelism of the contact unit to the other side of the contact unit in contact with the direction of a vertical. Said support means has composition with the coil spring which intervened towards the direction of a vertical between the supporter material arranged at the one side of a substrate body, and the flange prepared in the inside part of supporter material and the flange prepared at least in the lateral part of the contact unit.

[0010]

Moreover, it is desirable to adopt the configuration which arranges the 1st back up plate in contact with the body concerned in the other side of a substrate body. In this case, it is much more desirable to adopt the configuration which attaches supporter material in the 1st back up plate through the spacer inserted in punching formed in the substrate body.

[0011]

Moreover, it is desirable to make it the configuration which prepared the heat-conduction sheet between a substrate body and the 1st back up plate. Similarly, it is good to prepare a heat-conduction sheet respectively between a spacer and the 1st back up plate and between a spacer and supporter material.

[0012]

Moreover, it is good to use a screw as a parallelism adjustment device. That is, it is good to screw the screw on the 1st back up plate, and to adopt the configuration in which the point contacts said contact unit through the hole formed in the substrate body. In this case, the 2nd back up plate which plugs up the hole formed on the plate concerned is attached in the 1st back up plate, the screw is screwed on the 2nd back up plate, and it is desirable to adopt the configuration which contacts the part in which the point of this screw is equivalent to the upper part location of the contact unit of a substrate body through said hole.

[0013]

Furthermore, it is desirable to adopt the configuration in which the heat-conduction sheet was prepared between the 1st back up plate and the 2nd back up plate.

[0014]

[Embodiment of the Invention]

Hereafter, the gestalt of operation of the probe card concerning this invention is explained, referring to drawing 1 thru/or drawing 3. the probe card of drawing 1 concerning the gestalt of operation of the 1st of this invention is rough — it is a sectional view a part. the probe card of drawing 2 concerning the gestalt of operation of the 2nd of this invention is rough — it is a sectional view a part. the probe card of drawing 3 concerning the gestalt of operation of the 3rd of this invention is rough — it is a sectional view a part.



[0015]

<The 1st operation gestalt>

The probe card concerning the gestalt of the 1st operation is what is used in performing the electric trial of test objective-ed objects, such as a semiconductor device. The substrate body 100, The contact unit 300 in which electrical installation is made by the substrate body 100 through INTAPOZA 200 while being prepared in the lower part side of the substrate body 100 and performing electric contact to a test objective-ed object, The support means 400 which supports the contact unit 300 with elastic force from a lower part side, It has the parallelism stretching screw 500 as a parallelism adjustment device which adjusts the parallelism of the contact unit 300 to the contact unit 300 in contact with the direction of a vertical from an upper part side, and the back up plate 600 (it is equivalent to the 1st back up plate) fixed above the substrate body 100 by contacting this.

[0016]

The circuit pattern etc. is formed in the front face, and the substrate body 100 has become connectable electrically with the circuit tester outside drawing. Measurement of the electrical characteristics of a test objective-ed object is performed by this circuit tester.

[0017]

The back up plate 600 is a substrate with which the circle-like hole 610 was formed in the center section of the top face, touches the substrate body 100 and is being fixed with the fixed screw 601. That in which the screw head section was prepared horizontally is used for the fixed screw 601 like NABENEJI. For this reason, the horizontal gap with the substrate body 100 and the back up plate 600 can be adjusted easily.

[0018]

A total of three parallelism stretching screws 500 are screwed on the height 603 which made disc-like [ which the hole 610 of the back up plate 600 has the level difference, among those is equivalent to a base ] at intervals of the pitch 120 degrees. The jam nut 510 for regulating rotation is screwed on the parallelism stretching screw 500, and it rotates carelessly.

[0019]

The parallelism stretching screw 500 is in contact with the contact unit 300 through the hole 102 where the point was formed in the substrate body 100. The point of the parallelism stretching screw 500 is formed in the shape of a curved surface, and, for this reason, makes a ball like before unnecessary.

[0020]

The contact unit 300 consists of a needle unit 310 by which two or more contact for contacting a test objective-ed object and connecting electrically was attached in the circular substrate, and a needle unit holder 320 which made the shape of a ring which supports the periphery section of the needle unit 310 from the lower part. The needle unit holder 320 is making cross-section inverse L-shaped, and at least the lateral part is the ring-like flange 321.

[0021]

INTAPOZA 200 is junction terminal block which connects electrically between the circuit pattern formed in the top face of the needle unit 310 of the contact unit 300, the circuit patterns formed in the inferior surface of tongue of the substrate body 100. The bottom probe 201 with which a tip contacts the circuit pattern by the side of the needle unit 310 etc., It has composition with the substrate 203 with which the pattern which each other end of the top probe 202 with which a tip contacts the circuit pattern by the side of the substrate body 100 etc., and the top and the bottom probes 201 and 202 is being fixed, and carries out electrical connection of between each probe was formed. The hole 204 for letting the parallelism stretching screw 500 pass is formed in the substrate 203.

[0022]

The support means 400 has composition with the coil spring 420 which intervened towards the direction of a vertical between the ring-like supporter material 410 which made the shape of a cross section of L characters arranged in the one side of the substrate body 100, and the contact unit 300 and the supporter material 410. The inside part of the supporter material 410 serves as the ring-like flange 411. That is, two or more mediation of the coil spring 420 is carried

out between the flange 321 of the needle unit holder 320, and the flange 411 of the supporter material 410.

[0023]

Through the spacer 430 for height adjustment inserted in the punching 101 formed in the substrate body 100, the supporter material 410 uses the fixed screw 440 for the back up plate 600, and is attached in it. The hold crevice 413 in which the head of the fixed screw 440 is held is formed in the supporter material 410 so that the head of the fixed screw 440 may not project in a lower part side (test objective-ed object side).

[0024]

In addition, the field (inferior surface of tongue) where the needle unit holder 320 of the supporter material 410 and the contact unit 300 all counters a test objective-ed object is established as a 6.3 or less \*\*\*\* Ry or 6.3 or less Rz mirror plane. The radiant heat etc. was reflected according to this mirror plane, and it has controlled that supporter material 410 grade becomes an elevated temperature.

[0025]

Between a spacer 430 and the supporter material 410, the heat-conduction sheet intervenes between the back up plate 600 and a spacer 430 between the substrate body 100 and the back up plate 600. Thereby, the temperature gradient between each part material was lessened, and the curvature by the temperature gradient between each part material is controlled.

[0026]

In the probe card which consists of the above-mentioned configuration, since it is supported by the coil spring 420 to which the contact unit 300 intervened towards the direction of a vertical between the supporter material 410, as compared with what is supported by the conventional flat spring, the rate of change of the compressive force over the amount of strokes is small, and becomes good [ the linearity of the amount of strokes, and elastic force ]. For this reason, while being able to prevent exactly breakage and deformation of the needle unit holder 320, the parallelism of the contact unit 300 can also be adjusted easily.

[0027]

Moreover, since the supporter material 410 is attached in the back up plate 600 through the spacer 430, the elastic force of a coil spring 420 cannot act on the substrate body 100 directly, but can prevent deformation of the substrate body 100. And since the heat-conduction sheet intervenes between the substrate body 100 and the back-up-plate 600 grade, heat conduction between these each part becomes good, and the curvature by the temperature gradient between each part material can be prevented. These results, high location precision is realized between INTAPOZA 200 and the substrate body 100 between the contact unit 300 and INTAPOZA 200 between a test objective-ed object and the contact unit 300, and it becomes possible to perform measurement by good switch-on as a result.

[0028]

<The gestalt of the 2nd operation>

Next, although the probe card concerning the gestalt of the 2nd operation is explained, about the thing concerning the gestalt of the 1st operation, and the thing which has same configuration and function, the detailed explanation is omitted using the same sign.

[0029]

In the probe card concerning the gestalt of the 2nd operation, differing from the gestalt of the 1st operation greatly is only the point that the supporter material 410 is attached in the back up plate 600 using the fixed screw 440, without using a spacer 430. Since the fixed screw 440 is inserted in the punching 103 formed in the substrate body 100, the elastic force of a coil spring 420 cannot act on the substrate body 100 directly, but deformation of the substrate body 100 can be prevented, and this point is the same as that of the case of the gestalt of the 1st operation.

[0030]

Moreover, between the substrate body 100 and the back up plate 600, since the heat-conduction sheet intervenes respectively between the substrate body 100 and the supporter material 410, the temperature gradient between each part material can be lessened like the case

of the gestalt of the 1st operation. From this, the curvature by the temperature gradient between each part material can be prevented, and this point is the same as that of the case of the gestalt of the 1st operation.

[0031]

<The gestalt of the 3rd operation>

Next, although probe card \*\*\*\*\* explanation is given, about the thing concerning the gestalt of the 3rd operation which has the 1st, and the same same configuration and function as the gestalt of the 2nd operation, the detailed explanation is omitted using the same sign.

[0032]

In the probe card concerning the gestalt of the 3rd operation, differing from the gestalt of the 1st operation greatly is only a point which the screw 620 is screwed on the back up plate 630 as if the back up plate 630 which plugs up a hole 610 is attached in the back up plate 600, and is in contact with the part in which the point of a screw 620 is equivalent to the upper part location of the contact unit 310 of the substrate body 100 through a hole 610. The jam nut 621 is screwed on the screw 620, and it rotates carelessly. The point of a screw 620 is formed in the shape of a curved surface. Moreover, the heat-conduction sheet intervenes also between the back up plate 620 and the back up plate 630.

[0033]

Since the elastic force of a coil spring 420 acts on the substrate body 100 through the contact unit 320 and INTAPOZA 200, it becomes the inclination for the central part of the substrate body 100 to curve upward, but since this part is suppressed with the screw 620, the deformation of the substrate body 100 also including the point that the heat-conduction sheet intervenes between the back up plate 620 and the back up plate 630 can be prevented exactly. Therefore, high location precision is realized between INTAPOZA 200 and the substrate body 100 between the contact unit 300 and INTAPOZA 200 between a test objective-ed object and the contact unit 300, and it becomes possible to perform measurement by good switch-on as a result.

[0034]

In addition, like the gestalt of the 1st operation, if it is in the gestalt of the 3rd operation, although the spacer 430 is intervened between the supporter material 410 and the back up plate 600, it is also possible to adopt the gestalt of the 2nd operation and the gestalt between which a spacer 430 is not made to be placed similarly.

[0035]

In addition, the probe card concerning this invention may use the thing of what kind of configuration, as long as it has the function to carry out electrical installation to a substrate body through INTAPOZA, while not being limited to the gestalt of the above-mentioned implementation, for example, performing electric contact to a test objective-ed object about the contact unit. This point is the same also about a parallelism adjustment device. Moreover, about a support means, as long as it has the function which supports the one side of the contact unit with elastic force using the coil spring which intervened towards the direction of a vertical between the flange prepared in the inside part of supporter material, and the flange prepared at least in the lateral part of the contact unit, the thing of what kind of configuration may be used. Furthermore, you may make it adopt the configuration which omitted the back up plate.

[0036]

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[Translation done.]

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DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1] rough [ for explaining the gestalt of operation of the 1st of the probe card concerning this invention ] — it is a sectional view a part.

[Drawing 2] the probe card concerning the gestalt of operation of the 2nd of this invention is rough — it is a sectional view a part.

[Drawing 3] the probe card concerning the gestalt of operation of the 3rd of this invention is rough — it is a sectional view a part.

[Drawing 4] It is the rough sectional view showing the conventional probe card.

[Description of Notations]

100 Substrate Body

101 Punching

103 Punching

200 INTAPOZA

300 Contact Unit

310 Needle Unit

320 Needle Unit Holder

321 Flange

400 Support Means

410 Supporter Material

411 Flange

420 Elastic Member

440 Fixed Means

500 Parallelism Stretching Screw

600 Back Up Plate (1st Back Up Plate)

610 Screw

630 Back Up Plate (2nd Back Up Plate)

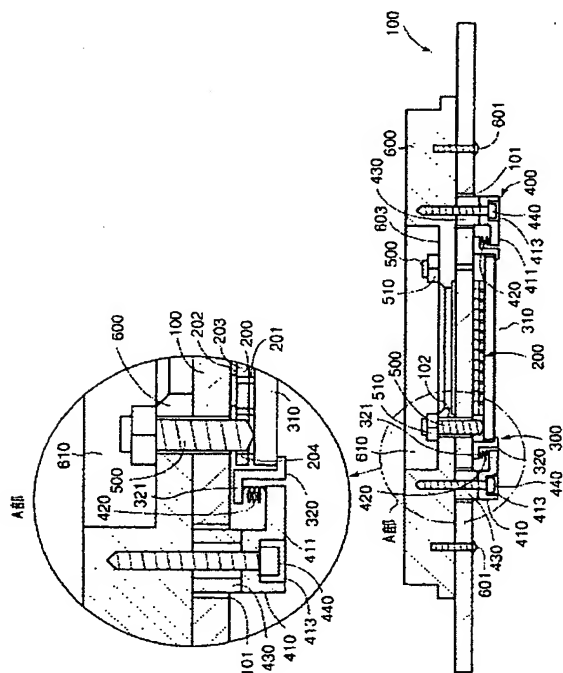
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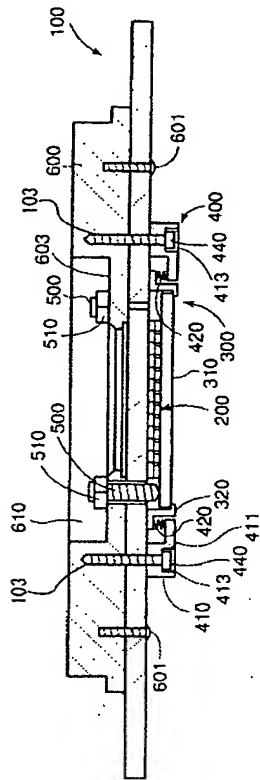
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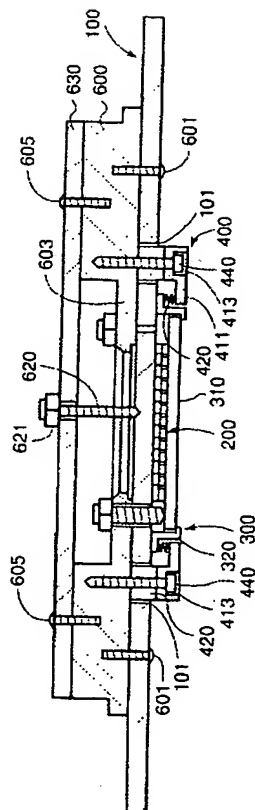
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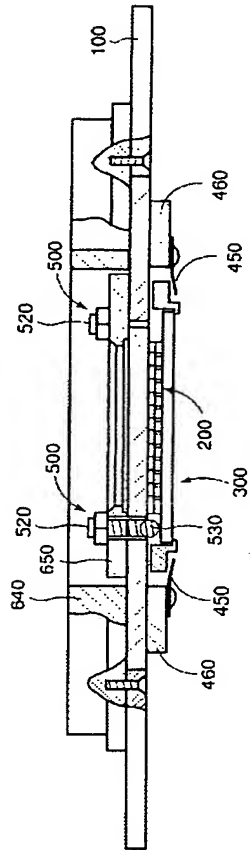


[Drawing 2]



[Drawing 3]



[Drawing 4]

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AB07 AC14 AE03 AF07  
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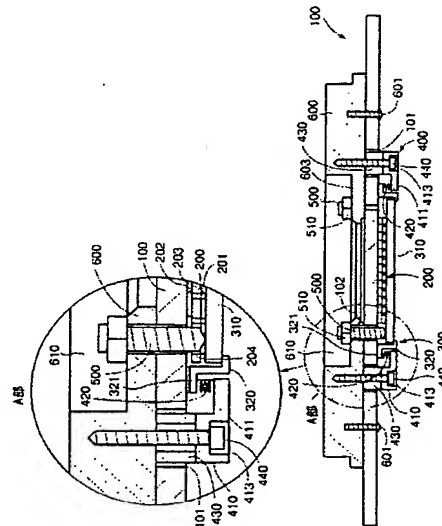
(54) 【発明の名称】 プローブカード

(57) 【要約】 (修正有)

【課題】 接触子ユニット等の構成部品の変形を防止し、良好な導通状態のもと試験を行い得るようにするプローブカード

【解決手段】 基板本体100と、基板本体100の下側に設けられ被試験対象物に対して電気的接触を行うとともに基板本体100に電気的接続を行う接触子ユニット300と、接触子ユニット300の下側を弾性力をもって支持する支持手段400と、接触子ユニット300の上側に鉛直方向に当接して接触子ユニット300の平行度を調整する平行度調整ネジ500とを備えている。特に、支持手段400は、基板本体100の下側に配置された支持部材410の内側部位に設けられた鍔部411と接触子ユニット300の外側部位に設けられた鍔部321との間に鉛直方向に向けて介在されたコイルスプリング420とを有した構成となっている。

【選択図】 図1





## 【特許請求の範囲】

## 【請求項 1】

半導体デバイス等の被試験対象物の電氣的試験を行うのに使用されるプローブカードにおいて、基板本体と、基板本体の一方側に設けられ被試験対象物に対して電氣的接触を行うとともに基板本体にインターポーザを介して電氣的接続を行う接触子ユニットと、接触子ユニットの一方側を弾性力をもって支持する支持手段と、接触子ユニットの他方側に鉛直方向に当接して接触子ユニットの平行度を調整する平行度調整手段とを備えており、前記支持手段は、基板本体の一方側に配置された支持部材と、支持部材の内側部位に設けられた鍔部と接触子ユニットの外側部位に設けられた鍔部との間に鉛直方向に向けて介在されたコイルスプリングとを有した構成となっていることを特徴とするプローブカード。

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## 【請求項 2】

請求項 1 記載のプローブカードにおいて、基板本体の他方側には当該本体に接触する第 1 の補強板が配設されていることを特徴とするプローブカード。

## 【請求項 3】

請求項 2 記載のプローブカードにおいて、支持部材は基板本体に形成された穿孔に挿入されるスペーサを介して第 1 の補強板に取り付けられていることを特徴とするプローブカード。

## 【請求項 4】

請求項 2 記載のプローブカードにおいて、基板本体と第 1 の補強板との間には熱伝導シートが設けられていることを特徴とするプローブカード。

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## 【請求項 5】

請求項 3 記載のプローブカードにおいて、基板本体と第 1 の補強板との間、前記スペーサと第 1 の補強板との間、及び前記スペーサと前記支持部材との間には熱伝導シートが各々設けられていることを特徴とするプローブカード。

## 【請求項 6】

請求項 2 乃至 5 記載のプローブカードにおいて、前記平行度調整手段としてのネジが第 1 の補強板に螺着されており、当該ネジの先端部が基板本体に形成された穴を通して前記接触子ユニットに当接している一方、第 1 の補強板には当該板上に形成された穴を塞ぐ第 2 の補強板が取り付けられており、第 2 の補強板にネジが螺着されており、当該ネジの先端部が前記穴を通して基板本体の接触子ユニットの上方位置に相当する部分に当接していることを特徴とするプローブカード。

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## 【請求項 7】

請求項 6 記載のプローブカードにおいて、第 1 の補強板と第 2 の補強板との間には熱伝導シートが設けられていることを特徴とするプローブカード。

## 【発明の詳細な説明】

## 【0001】

## 【発明の属する技術分野】

本発明は、半導体デバイス等の電氣的特性を計測するためのプローブカードに関する。

## 【0002】

## 【従来の技術】

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近年、プローブカードによるウエハテストに関しては、複数のチップを同時に計測することがなされている。従来のプローブカードとして、図 4 に示すように、被試験対象物たる半導体デバイスに電氣的接触を行う接触子を含む接触子ユニット 300 と基板本体 100 とが別体化されているものが公知である。このようなプローブカードにあつては、基板本体 100 と接触子ユニット 300 とは、電氣的にはインターポーザ 200 を介して接続されている。

## 【0003】

また、基板本体 100 の下方側には自由端が内側方向に突出するように板バネ 450 が固定されており、接触子ユニット 300 は、該板バネ 450 に下方側から支持されるとともに、接触子ユニット 300 の平行度を調整するための平行度調整手段 500 が上面に当接

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するように設けられている。

【0004】

この平行度調整手段500は、基板本体100に設けられた穿孔を介して先端部が下方に突出するように基板本体100の上方に固定された補強板650に螺着された平行度調整ネジ520、及び、前記接触子ユニット300に当接するように平行度調整ネジ520の先端部（下方）に設けられたボール530から構成されてなり、平行度調整ネジ520の突出量を変更させることにより、接触子ユニット300の平行度を調整するように設けられている。

【0005】

【発明が解決しようとする課題】

しかしながら、従来のプローブカードにあっては、平行度調整の際、平行度調整ネジ520に調整ストロークをかけすぎた場合には、接触子ユニット300の変形及び破損が懸念される。つまり、接触子ユニット300を支持する板バネ450は、その性質上ストロークに応じた圧力変化量が大きく、このため、接触子ユニット300に過度の力が作用してしまい、この力により接触子ユニット300の変形や破損が発生することになる。このような接触子ユニット300の変形や破損は、接触子の高さバラツキを招き、測定対象物との導通不良をもたらすという問題を有している。同様に、上記のような接触子ユニット300の変形や破損は、インターポーザ200との導通不良をもたらすという問題をも有している。

【0006】

さらに、従来のプローブカードにあっては、図示のように、板バネ450は、基板本体100の下方に固定された板バネホルダ460に一端側が固定され、内側に突出した他端の自由端側が、接触子ユニット300を支持するように設けられている。また、基板本体100の上方には、内外にそれぞれ独立して補強板640、650が固定されており、外側の補強板640は、前記板バネホルダ460の上方位置に配され、内側の補強板650は、この外側の補強板640よりも内側で、板バネ450の自由端の上方位置に配されている。そして、この内側の補強板650には前記平行度調整ネジ500が螺着されている。このため、上記板バネ450によって作用する力は、板バネホルダ460に対しては、下方側への力として作用し、内側の補強板650に対しては、上方側への力として作用することになる。そして、上述のように板バネホルダ460の上方に位置する外側の補強板640と、板バネの自由端の上方に位置する内側の補強板650とは独立して設けられているので、基板本体100には、板バネ450による力が、場所によって上方及び下方の異なる方向に作用し、このため、板バネ450の力によって、基板本体100の変形が生じ、かかる変形は、電気的な導通不良をまねくおそれが存在する。

【0007】

さらに、高温下のもとの試験において、各構成部材の温度差を生じ、かかる温度差に基づく各構成部材のひずみ量の相違により、基板本体全体の反りが発生し、この反りにより電気的な導通不良をまねく問題をも有している。なお、かかる問題は、各部材の温度差に対応して熱膨張率を調整した材料を用いて、反りを発生しないようにすることも考えられるが、材料の熱膨張率を精密に調整して、反りを完全に防止することは現実的には不可能である。

【0008】

本発明は上記した背景の下で創作されたものであり、接触子ユニット等の構成部材の変形を防止し、良好な導通状態のもと試験が行い得るプローブカードを提供することを目的としている。

【0009】

【課題を解決するための手段】

本発明のプローブカードは、半導体デバイス等の被試験対象物の電気的試験を行うのに使用されるプローブカードであって、基板本体と、基板本体の一方側に設けられ被試験対象物に対して電気的接触を行うとともに基板本体にインターポーザを介して電気的接続を行

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う接触子ユニットと、接触子ユニットの一方側を弾性力をもって支持する支持手段と、接触子ユニットの他方側に鉛直方向に当接して接触子ユニットの平行度を調整する平行度調整手段とを備えており、前記支持手段は、基板本体の一方側に配置された支持部材と、支持部材の内側部位に設けられた鍔部と接触子ユニットの外側部位に設けられた鍔部との間に鉛直方向に向けて介在されたコイルスプリングとを有した構成となっている。

【0010】

また、基板本体の他方側には当該本体に接触する第1の補強板を配設する構成を採用することが好ましい。この場合、支持部材を基板本体に形成された穿孔に挿入されるスペーサを介して第1の補強板に取り付ける構成を採用することが一層好ましい。

【0011】

また、基板本体と第1の補強板との間には熱伝導シートを設けた構成にすることが好ましい。同様に、スペーサと第1の補強板との間及びスペーサと支持部材との間に熱伝導シートを各々設けるようにすると良い。

【0012】

また、平行度調整手段としてはネジを用いると良い。即ち、ネジが第1の補強板に螺着されており、その先端部が基板本体に形成された穴を通して前記接触子ユニットに当接する構成を採用すると良い。この場合、第1の補強板には当該板上に形成された穴を塞ぐ第2の補強板が取り付けられており、第2の補強板にネジが螺着されており、このネジの先端部が前記穴を通して基板本体の接触子ユニットの上方位置に相当する部分に当接する構成を採用することが好ましい。

【0013】

更に、第1の補強板と第2の補強板との間には熱伝導シートが設けられた構成を採用することが望ましい。

【0014】

【発明の実施の形態】

以下、本発明に係るプローブカードの実施の形態を図1乃至図3を参照しつつ説明する。図1は本発明の第1の実施の形態に係るプローブカードの概略的一部断面図である。図2は本発明の第2の実施の形態に係るプローブカードの概略的一部断面図である。図3は本発明の第3の実施の形態に係るプローブカードの概略的一部断面図である。

【0015】

〈第1の実施形態〉

第1の実施の形態に係るプローブカードは、半導体デバイス等の被試験対象物の電氣的試験を行うに当たり使用されるものであって、基板本体100と、基板本体100の下方側に設けられ被試験対象物に対して電氣的接触を行うとともに基板本体100にインターポザ200を介して電氣的接続がなされる接触子ユニット300と、接触子ユニット300を下方側から弾性力をもって支持する支持手段400と、接触子ユニット300に上方側から鉛直方向に当接して接触子ユニット300の平行度を調整する平行度調整手段としての平行度調整ネジ500と、基板本体100の上方にこれに接触して固定された補強板600（第1の補強板に相当する）とを備えている。

【0016】

基板本体100はその表面に配線パターン等が形成されており、図外のテストと電氣的に接続可能になっている。被試験対象物の電氣的特性の測定は同テストにより行われる。

【0017】

補強板600は、その上面の中央部に円状の穴610が形成された基板であって、基板本体100に接触しており、固定ネジ601により固定されている。固定ネジ601は、例えばナベネジのように、ネジ頭部が水平に設けられたものを用いている。このため、基板本体100と補強板600との水平方向のズレを容易に調整することができる。

【0018】

補強板600の穴610は段差を有しており、その内底面に相当する円板状をなした突起部603には合計3本の平行度調整ネジ500が120度ピッチ間隔で螺着されている。

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平行度調整ネジ500には、回転を規制するための回り止めナット510が螺着されており、不用意に回転しないようになっている。

【0019】

平行度調整ネジ500は、その先端部が基板本体100に形成された穴102を通して接触子ユニット300に当接している。平行度調整ネジ500の先端部は、曲面状に形成されており、このため、従来のようなボールを不要としている。

【0020】

接触子ユニット300は、被試験対象物に接触して電氣的に接続するための複数の接触子が円形基板に取り付けられた針ユニット310と、針ユニット310の外周部をその下方から支持するリング状をなした針ユニットホルダ320とからなる。針ユニットホルダ320は断面逆L字状をなしており、その外側部位がリング状の鍔部321となっている。

【0021】

インターポーザ200は、接触子ユニット300の針ユニット310の上面に形成された配線パターン等と基板本体100の下面に形成された配線パターン等との間を電氣的に接続する中継端子ブロックであって、先端が針ユニット310側の配線パターン等に接触する下側プローブ201と、先端が基板本体100側の配線パターン等に接触する上側プローブ202と、上側、下側プローブ201、202の各他端が固定されており且つ各プローブ間を電気接続するパターンが形成された基板203とを有した構成となっている。基板203には、平行度調整ネジ500を通すための穴204が形成されている。

【0022】

支持手段400は、基板本体100の一方側に配設された断面L字状をなしたリング状の支持部材410と、接触子ユニット300と支持部材410との間に鉛直方向に向けて介在されたコイルスプリング420とを有した構成となっている。支持部材410の内側部位はリング状の鍔部411となっている。即ち、コイルスプリング420は、針ユニットホルダ320の鍔部321と支持部材410の鍔部411との間に複数介在されている。

【0023】

支持部材410は、基板本体100に形成された穿孔101に挿入される高さ調整用のスペーサ430を介して補強板600に固定ネジ440を用いて取り付けられている。支持部材410には、固定ネジ440の頭部が下方側（被試験対象物側）に突出しないように、固定ネジ440の頭部を収容する収容凹部413が形成されている。

【0024】

なお、支持部材410及び接触子ユニット300の針ユニットホルダ320は、何れも被試験対象物に対向する面（下面）が、面粗Ry6.3以下、若しくは、Rz6.3以下の鏡面として設けられている。この鏡面により放射熱等を反射させて、支持部材410等が高温になるのを抑制している。

【0025】

基板本体100と補強板600との間、補強板600とスペーサ430との間、スペーサ430と支持部材410の間には、熱伝導シートが介在されている。これにより、各部材間の温度差を少なくして、各部材間の温度差による反りを抑制している。

【0026】

上記構成からなるプローブカードにおいては、接触子ユニット300が支持部材410との間に鉛直方向に向けて介在されたコイルスプリング420によって支持されているので、ストローク量に対する圧縮力の変化率は、従来の板バネで支持するものに比して小さく、ストローク量と弾性力との直線性も良好となる。このため、針ユニットホルダ320の破損・変形を的確に防止することができるとともに、接触子ユニット300の平行度も容易に調整することができる。

【0027】

また、支持部材410がスペーサ430を介して補強板600に取り付けられていることから、コイルスプリング420の弾性力が基板本体100に直接に作用せず、基板本体100の変形を防止することができる。しかも基板本体100と補強板600等との間には

熱伝導シートが介在されているので、これらの各部間での熱伝導が良好になり、各部材間の温度差による反りを防止することができる。これらの結果、被試験対象物と接触子ユニット300との間、接触子ユニット300とインターポーザ200との間、インターポーザ200と基板本体100との間で高い位置精度が実現され、結果として、良好な導通状態での計測を行うことが可能になる。

【0028】

〈第2の実施の形態〉

次に、第2の実施の形態に係るプローブカードについて説明するが、第1の実施の形態に係るものと同様の構成・機能を有するものについては、同一符号を用い、その詳細な説明を省略する。

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【0029】

第2の実施の形態に係るプローブカードにおいて、第1の実施の形態と大きく異なるのは、スペーサ430を用いることなく、支持部材410が固定ネジ440を用いて補強板600に取り付けられている点だけである。固定ネジ440は基板本体100に形成された穿孔103に挿通されているので、コイルスプリング420の弾性力が基板本体100に直接に作用せず、基板本体100の変形を防止することができ、この点は、第1の実施の形態の場合と同様である。

【0030】

また、基板本体100と補強板600との間、基板本体100と支持部材410との間には熱伝導シートが各々介在されているので、第1の実施の形態の場合と同様に、各部材間の温度差を少なくすることができる。このことから、各部材間の温度差による反りを防止することができ、この点も、第1の実施の形態の場合と同様である。

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【0031】

〈第3の実施の形態〉

次に、第3の実施の形態に係るプローブカードについて説明するが、第1及び第2の実施の形態と同様の構成・機能を有するものについては、同一符号を用い、その詳細な説明を省略する。

【0032】

第3の実施の形態に係るプローブカードにおいて、第1の実施の形態と大きく異なるのは、補強板600には穴610を塞ぐ補強板630が取り付けられるとともに、補強板630にネジ620が螺着されており、ネジ620の先端部が穴610を通して基板本体100の接触子ユニット310の上方位置に相当する部分に当接している点だけである。ネジ620には回り止めナット621が螺着されており、不用意に回転しないようになっている。ネジ620の先端部は曲面状に形成されている。また、補強板620と補強板630との間にも熱伝導シートが介在されている。

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【0033】

コイルスプリング420の弾性力は接触子ユニット320及びインターポーザ200を通じて基板本体100に作用することから、基板本体100の中央部分が上方向に反る傾向になるが、この部分がネジ620により押さえ付けられているので、補強板620と補強板630との間に熱伝導シートが介在されている点も含めて、基板本体100の変形を的確に防止することができる。そのため、被試験対象物と接触子ユニット300との間、接触子ユニット300とインターポーザ200との間、インターポーザ200と基板本体100との間で高い位置精度が実現され、結果として、良好な導通状態での計測を行うことが可能になる。

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【0034】

なお、第3の実施の形態にあつては、第1の実施の形態と同様に、支持部材410と補強板600との間にスペーサ430を介在しているが、第2の実施の形態と同様にスペーサ430を介在させない形態を採用することも可能である。

【0035】

なお、本発明に係るプローブカードは上記実施の形態に限定されず、例えば、接触子ユニ

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ットについては、被試験対象物に対して電氣的接触を行うとともに基板本体にインターポーザを介して電氣的接続を行う機能を有する限り、どのような構成のものを用いても良い。この点は平行度調整手段についても同様である。また、支持手段については、支持部材の内側部位に設けられた鍔部と接触子ユニットの外側部位に設けられた鍔部との間に鉛直方向に向けて介在されたコイルスプリングを用いて、接触子ユニットの一方側を弾性力をもって支持する機能を有する限り、どのような構成のものを用いても良い。更に、補強板を省略した構成を採用するようにしてもかまわない。

【0036】

【発明の効果】

以上、本発明に係るプローブカードによる場合、接触子ユニットが、支持部材との間に鉛直方向に向けて介在されたコイルスプリングによって支持された構成となっているので、従来の板バネで支持するものに比して、ストローク量に対する圧縮力の変化率が小さくなり、ストローク量と弾性力との直線性も良好となる。このため、針ユニットホルダの破損・変形を的確に防止することができる一方、接触子ユニットの平行度も容易に調整することができ、結果として、良好な導通状態での計測を行うことが可能になる。

【0037】

基板本体の他方側にこれに接触する第1の補強板を配設する構成とした場合、第1の補強板によって基板本体の変形を防止することができる。更に、支持部材を基板本体に形成された穿孔に挿入されるスペーサを介して第1の補強板に取り付ける構成とした場合、コイルスプリングの弾性力が基板本体に直接に作用しなくなり、この点で基板本体の変形を的確に防止することができる。これに伴って、被試験対象物と接触子ユニットとの間、接触子ユニットとインターポーザとの間、インターポーザと基板本体との間で高い位置精度が実現され、この点で、良好な導通状態での計測を行うことが可能になる。

【0038】

基板本体と第1の補強板の間等に熱伝導シートを設けた構成にした場合、これらの各部間での熱伝導が良好になるため、各部材間の温度差による反りを防止することができ、この点で、上記と同様に良好な導通状態での計測を行うことが可能になる。

【0039】

第1の補強板には当該板上に形成された穴を塞ぐ第2の補強板が取り付けられており、第2の補強板にネジが螺着されており、このネジの先端部が前記穴を通して基板本体の接触子ユニットの上方位位置に相当する部分に当接する構成にした場合、コイルスプリングの弾性力が接触子ユニット及びインターポーザを通じて基板本体に作用することから、基板本体の中央部分が上方に反る傾向になるが、この部分がネジにより押さえ付けられるので、基板本体の変形を的確に防止することができ、この点で、上記と同様に良好な導通状態での計測を行うことが可能になる。

【図面の簡単な説明】

【図1】本発明に係るプローブカードの第1の実施の形態を説明するための概略的一部断面図である。

【図2】本発明の第2の実施の形態に係るプローブカードの概略的一部断面図である。

【図3】本発明の第3の実施の形態に係るプローブカードの概略的一部断面図である。

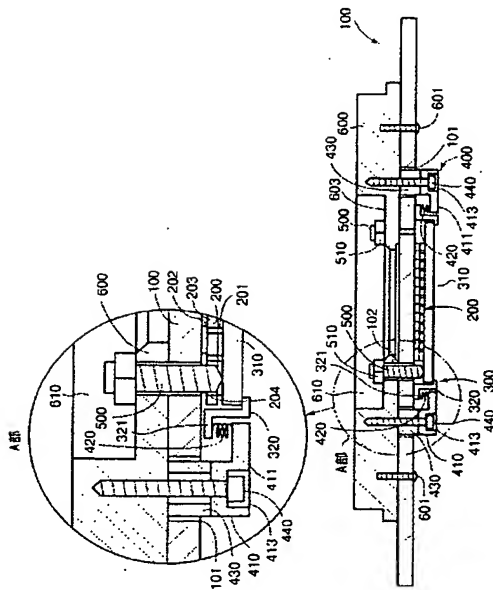
【図4】従来のプローブカードを示す概略的断面図である。

【符号の説明】

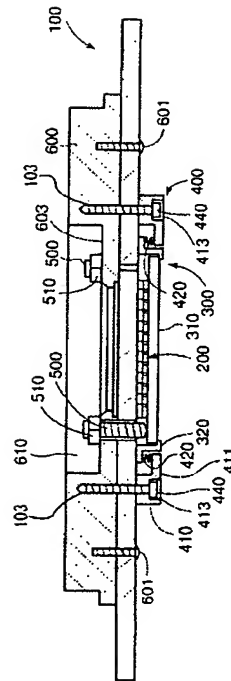
- 100 基板本体
- 101 穿孔
- 103 穿孔
- 200 インターポーザ
- 300 接触子ユニット
- 310 針ユニット
- 320 針ユニットホルダ
- 321 鍔部

- 4 0 0 支持手段
- 4 1 0 支持部材
- 4 1 1 鍔部
- 4 2 0 弾性部材
- 4 4 0 固定手段
- 5 0 0 平行度調整ネジ
- 6 0 0 補強板 (第 1 の補強板)
- 6 1 0 ネジ
- 6 3 0 補強板 (第 2 の補強板)

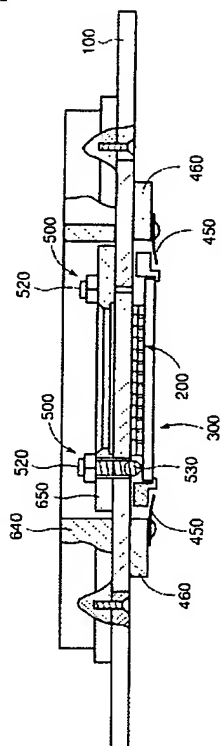
【図 1】



【図 2】



【図 4】





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